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2. Compliance and Enforcement

2.1 Overview

The primary responsibility for compliance with and the enforcement of the Energy Commission's Building Energy Efficiency Standards rests with the local enforcement agency, typically associated with a city or county government. Low-rise residential buildings must obtain a permit from the local enforcement agency before a new building may be constructed, before constructing an addition, and before alterations are made to existing buildings. Before a permit is issued, the local enforcement agency examines the plans and specifications for the proposed building to verify compliance with all applicable codes and standards. Verification of compliance with the Building Energy Efficiency Standards, which is done by comparing the requirements specified on the Certificate of Compliance (CF1R) with the plans and specifications for the building, is the enforcement agency's plan check responsibility. The enforcement agency's plans examiner must also verify that the plans and specifications for the building are in compliance with the building code, plumbing code, electrical code, mechanical code, and all other applicable codes and standards adopted by the local enforcement agency.

Once the enforcement agency has determined that the proposed building (as represented in the plans and specifications) complies with all applicable codes and standards, a building permit may be issued at the request of the builder or the owner of the proposed building. This is the first significant milestone in the compliance and enforcement process. Once construction starts, the enforcement process begins for the Inspector who will verify that the installed building components (HVAC equipment, fenestration, lighting, insulation, etc.) match the energy components modeled on the Certificate of Compliance (CF1R) during each respective phase of construction (i.e. footing/foundation, rough frame, insulation, etc.). After building construction is complete, the local enforcement agency completes the final inspection and issues the Certificate of Occupancy. If the enforcement agency's final inspection determines that the building conforms to the plans and specifications approved during plan check, that all applicable Certificates of Installation (CF2R) and Certificates of Verification (CF3R) forms are registered and submitted for verification, and that it complies with all applicable codes and standards, the enforcement agency may approve the building. The enforcement agency's final approval is also a significant milestone.

While the permit and the Certificate of Occupancy are the most significant milestones, the compliance and enforcement process is significantly more involved and requires participation by a number of other persons and organizations including the architect or building designer, specialty engineers (mechanical, electrical, civil, etc.), energy consultants, contractors, the owner, third party inspectors (HERS raters), and many others. This chapter describes the overall compliance and enforcement process, and it

identifies the responsibilities for each person or organization throughout the permit process.

2.1.1 Compliance Document Registration

§10-103;
Reference Residential Appendix RA2;
Reference Joint Appendix JA7

New requirements for a documentation procedure called *registration* were introduced beginning with the 2008 Building Energy Efficiency Standards. *Registration* documentation is required for the construction and alteration of residential buildings for which HERS verification is required for compliance. *Registration* requirements will be described in this chapter, and elsewhere in this manual, as applicable. Also, *Reference Residential Appendix RA2 and Reference Joint Appendix JA7* provide detailed descriptions of document registration procedures and individual responsibilities for registration of Certificate(s) of Compliance (CF1R), Certificate(s) of Installation (CF2R), and Certificate(s) of Verification (CF3R).

Registration will be required for all low-rise residential buildings for which compliance requires HERS field verification. For the 2013 Building Energy Efficiency Standards, mandatory HERS verification will be required, with some exceptions, for all newly constructed residential buildings, so registration will be required for majority of these building types. When *registration* is required, persons responsible for completing and submitting compliance documents (Certificate of Compliance, Certificate of Installation, and Certificate of Verification) are required to submit the compliance form(s) electronically to an approved HERS provider data registry for registration and retention.

Compliance documents submitted to the registry shall be certified by the applicable responsible person (§10-103). The registry will assign a unique *registration* number to the document(s), provided the documents are completed correctly and a certification/signature is provided by the responsible person. The "registered" document will be retained by the HERS provider data registry, and copies of the unique registered document(s) will be made available via secure internet website access to authorized users of the HERS provider data registry for use in making electronic or paper copies of the registered document(s) for submittals to the enforcement agency as required, and for any other applicable purposes such as posting copies in the field for enforcement agency inspections and providing copies to the building owner (see Section 2.2.9).

Examples of authorized users of the HERS provider data registry may include energy consultants, builders, building owners, construction contractors and installers, HERS raters, enforcement agencies, the Energy Commission, and other parties to the compliance and enforcement process that the documents are designed to support.

Authorized users of the registry will be granted read/write access rights to only the electronic data that pertains to their project(s).

NOTE: Documents submitted to public agencies for code compliance are considered public information.

2.2 Phases

Compliance and Enforcement

The process of complying with and enforcing the Building Energy Efficiency Standards in residential buildings involves many parties. Those involved may include the architect or designer, builder/developer, purchasing agent, general contractor, subcontractor/installer, energy consultant, plan checker, inspector, realtor, and owner/first occupant. All of these parties must communicate and cooperate in order for the compliance and enforcement process to run efficiently.

The standards specify detailed reporting requirements that are intended to provide design, construction, and enforcement parties with required information to complete the building process and ensure that the energy features are properly installed. Each party is accountable for ensuring that the building's energy features are correctly installed in their area of responsibility. This section outlines each phase of the process, and discusses responsibilities and requirements associated with them.

The Energy Compliance documentation has been revised and reorganized. Versions of the Certificate of Compliance have been designed to be used specifically with Residential New construction (CF1R), Residential Additions (CF1R-ADD), Residential Alterations (CF1R-ALT), and Residential HVAC change-outs (CF1R-ALT-HVAC). The Certificate of Installation (CF-2R) is separated into Envelope (CF2R-ENV), Lighting (CF2R-LTG), and Mechanical (CF2R-MECH) categories, and most compliance measures have a separate CF2R form that is specific to a particular installation. CF2R forms also incorporate references to applicable mandatory measures. The HERS Certificate of Verification (CF3R) forms are categorized and organized in the same way as the Certificate of Installation (CF2R) forms. Refer to Appendix A of this manual for more information about the forms, or to view samples of the forms. Additional information about use of the compliance forms will be provided in applicable sections of this chapter and throughout this manual.

The Building Energy Efficiency Standards require residential energy compliance documents to be *registered* with a HERS provider data registry prior to submittal to an enforcement agency when HERS verification is required for compliance. The registration of documents prior to submittal to an enforcement agency accomplishes retention of a completed and signed copy of the submitted energy compliance documentation. Section 10-103 of the Building Energy Efficiency Standards allows the registered CF1R-ALT-HVAC form to be submitted to an enforcement agency at final inspection, and not before obtaining a permit, to facilitate the permit process for HVAC change-outs. Refer to

Chapter 9 of this manual for more details. Document retention is vital to compliance and enforcement follow-up and other quality assurance follow-up processes that ensure realization of energy savings from installed energy features. Although some local enforcement agencies elect to retain copies of submitted residential energy compliance documents, many jurisdictions do not retain these documents. Thus, the Energy Standards requirement for registration of the energy compliance documentation in a HERS provider data registry ensures that document retention is accomplished for the residential construction projects that require HERS verification for compliance. General information describing registration procedures that are specific to the design, construction and inspection phases follow in this chapter. Refer also to Reference Residential Appendix RA2 and Reference Joint Appendix JA7 for more detailed descriptions of these document *registration* procedures that apply to each phase of the building energy code compliance and enforcement process.

2.2.1 Design Phase

§10-103(a)2

This phase sets the stage for the type and style of building to be constructed. In addition to issues concerning zoning, lot orientation and infrastructure, the building's overall design and energy features are documented in the construction documents and/or specifications. Parties associated with this phase must ensure that the building complies with the Building Energy Efficiency Standards and that the significant features required for compliance are documented on the plans and/or specifications.

During the design process, an energy consultant or other professional will typically assist the building designer by providing energy calculations that determine the impact of building features being proposed for the design to ensure that the final building design plans and specifications submitted to the enforcement agency will comply with the Building Energy Efficiency Standards. Throughout the design phase, recommendations or alternatives may be suggested by energy consultants or the documentation author to assist the designer in achieving compliance.

The building design plans submitted to the enforcement agency are required to include the specifications for the building energy features that are necessary to achieve compliance, including insulation levels, window performance, equipment performance, lighting fixture types and controls, exhaust fan performance, envelope sealing, weather stripping requirements, and any other feature that was used for compliance or is a mandatory measure. The building design plans and specifications must be consistent with respect to the energy efficiency features information on the Certificate of Compliance (CF1R) submitted to the enforcement agency. Any change in the building plans or specifications, during any phase of design or construction, that changes the energy feature specifications for the design necessitates recalculation of the building energy compliance, and issuance of a revised Certificate of Compliance (CF1R) that is consistent with the revised plans and specifications for the proposed building. If recalculation indicates that the building no longer complies, alternate building features must be selected that bring the design back into compliance with the Building Energy Efficiency Standards.

2.2.2 Permit Application

§10-103(a)2

When the design is complete, the construction documents are prepared, and when other approvals (planning department, water, etc.) are secured, the owner or contractor makes an application for a building permit. This is generally the last step in a long process of planning and design. At this point, the infrastructure (streets, sewers, water lines, electricity, gas, etc.) is in place or is being constructed and it is time to begin the process of constructing the building(s).

To assist the enforcement agency in verifying that the proposed building complies with the Building Energy Efficiency Standards, a set of compliance documents are submitted with the building permit application. These documents consist of a Certificate of Compliance (CF1R), which is required by the Building Energy Efficiency Standards (see §10-103). The length and complexity of the documentation can vary considerably depending on: the number of buildings that are being permitted; whether or not an orientation-independent permit is being requested; whether the performance approach or the prescriptive approach is being used; and many other factors. An energy consultant who understands the code and is able to help the builder or owner comply with the standards in the most cost-effective manner often prepares the Certificate of Compliance documentation.

The Administrative Regulations §10-103(a)2 require that documentation be submitted with permit applications that will enable the plans examiner to verify the building's compliance. The forms used to demonstrate compliance must be readily legible and shall conform to a format and informational order and content approved by the Energy Commission. If registration is required, the CF1R that is submitted to the enforcement agency must be a registered copy from an approved HERS provider data registry.

The registration process requires the builder or designer to submit the Certificate of Compliance information and an electronic signature to an approved HERS provider data registry in order to produce a completed, signed and dated electronic Certificate of Compliance (CF1R) that is retained by the registry. The CF1R is assigned a unique registration number, then copies of the unique registered CF1R are made available to authorized users of the HERS provider data registry for use in making electronic or paper copies of the registered document(s) for submittal to the enforcement agency as required.

2.2.3 Plan Check

Local enforcement agencies check plans to ensure that the building design conforms to Building Standards. This includes health and safety requirements, such as fire and structural, and also the building energy efficiency requirements. Vague, missing, or incorrect information items on the construction documents are identified by the plans examiner, and when necessary, the permit applicant is required to make corrections or clarifications, then resubmit revised plans and specifications for verification by the plans examiner. When the permit applicant submits accurate, clearly defined plans and specifications, it helps to speed up the plan check process, since this provides the plans examiner with all the information that is needed to complete the plan check review. If the

plans examiner must go back to the applicant to request more information, it can be a time-consuming process that would be simplified (thus completed more easily and in less time) when complete and accurate construction documents are submitted for plan check approval.

With regard to energy code concerns, from the enforcement agency's perspective, the plan checker's responsibility is to verify that the information contained on the construction documents is consistent with the requirements specified on the energy efficiency compliance documents (the CF1R). Some examples of how the plans examiner will verify that the energy efficiency features detailed on the Certificate of Compliance (CF1R) forms are specified in the respective sections of the building plans include:

- Verifying the window and skylight U-Factor and SHGC values from the CF1R on the Structural/Architecture Plans in a window/skylight schedule, window/skylight legend for the floor plan, etc.; and
- Verifying the HVAC equipment SEER, EER, AFUE, etc. efficiency values from the CF1R on the Title 24 Plans, Mechanical Plans, etc. in an Equipment Schedule.

NOTE: The enforcement agency should clearly articulate to the builder/designer the acceptable methods of specifying energy features on the building plans for approval.

Since personnel that purchase building materials, and the building construction craftsmen in the field may rely solely on a copy of the approved plans and specifications for direction in performing their responsibilities, it is of utmost importance that the building design represented on the approved plans and specifications complies with the Building Energy Efficiency Standards as specified on the Certificate(s) of Compliance (CF1R).

The enforcement agency plans examiner must also verify that the compliance documents do not contain errors. When the compliance documents are produced by Energy Commission-approved computer software applications, there is less chance that there will be computational errors, but the plans examiner must still verify that the building design represented on the plans is consistent with the building energy features represented on the Certificate of Compliance (CF1R) documents. To obtain a list of Energy Commission-approved energy code compliance software applications, visit the Energy Commission website at:

http://www.energy.ca.gov/title24/2013standards/index.html

Or call the Efficiency Standards Hotline at 1-800-772-3300.

With production homes, where a builder may be constructing several identical houses at roughly the same time, the compliance documentation may be prepared in such a way that a house or model can be constructed in any orientation. In these instances, the Plans Examiner shall verify that the home complies facing all four main compass points (North, South, East, West) on the CF1R form.

2.2.4 Building Permit

After the plans examiner has approved the plans and specifications for the project, a building permit may be issued by the enforcement agency at the request of the builder. Issuance of the building permit is the first significant milestone in the compliance and enforcement process. The building permit is the green light for the contractor to begin the work. In some cases, the building permits are issued in phases. Sometimes there is a permit for site work and grading that precedes the permit for actual building construction.

2.2.5 Construction Phase

Upon receiving a building permit from the local enforcement agency, the contractor begins construction. The permit requires the contractor to construct the building in accordance with the plans and specifications, but often there are variations. Some of these variations are formalized through change orders. When change orders are issued, it is the responsibility of the permit applicant and the local jurisdiction to verify that compliance with the code is not compromised by the change order. In some cases, it will be quite clear if a change order would compromise compliance, for instance when an inexpensive single glazed window is substituted for a more expensive high performance window. However, it may be difficult to determine if a change order would compromise compliance; for instance, when the location of a window is changed, or when the orientation of the house is changed. Field changes that result in non-compliance require enforcement agency approval of revised plans and revised energy compliance documentation to confirm that the building is still in compliance with the Building Energy Efficiency Standards.

During the construction process, the general contractor or specialty subcontractors are required to complete various Certificate(s) of Installation (CF2R). The purpose of these certificates is to verify that the contractor is aware of the requirements of the Building Energy Efficiency Standards and that they have followed the Energy Commission-approved procedures for installation, and to identify the energy efficiencies and features of the installed building components. The Certificate(s) of Installation (CF2R) are a collection of separate energy compliance information forms that are applicable to each regulated energy feature that may be included in the construction. The certificates are required to be completed by each of the applicable specialty contractors when they install regulated energy features such as windows, water heater and plumbing, HVAC ducts and equipment, lighting, and insulation.

The licensed person responsible for the building construction, or for installation of an energy-related feature, must ensure their construction or installation work is done in accordance with the approved plans and specifications for the building, and must complete and sign a Certificate of Installation (CF2R) to certify that the installed features, materials, components or manufactured devices for which they are responsible conform to the plans and specifications and the Certificate of Compliance (CF1R) documents approved by the enforcement agency for the building. A copy of the completed, signed and dated CF2R must be posted at the building site for review by the enforcement agency in conjunction with requests for final inspection for the building, and copies of the registered CF2R forms shall be provided to the home owner (see section 2.2.9).

When any HERS verification is required for compliance, all of the CF2R forms must be registered from an approved HERS provider data registry. This is a new requirement under the 2013 Building Energy Efficiency Standards that will apply to both non-HERS CF2R forms (i.e. CF2R-ENV-01) and to HERS CF2R forms (i.e. CF2R-MECH-20-HERS) for installed features that require field verification by a HERS rater. When registration is required, the builder or installing contractor must submit information to an approved HERS provider data registry in order to produce a completed, signed and dated electronic Certificate of Installation (CF2R) that is retained by the registry for use by authorized users of the registry. After the information to complete the CF2R document is transmitted to the data registry and the form is electronically signed, the CF2R is assigned a registration number, and copies of the unique registered CF2R are made available to authorized users of the HERS provider data registry for use in making electronic or paper copies of the registered document(s) for submittal to the enforcement agency as required. The builder or installing contractor responsible for the installation must provide a copy of the completed, signed, and registered Certificate of Installation to the HERS rater, and post a copy at the building site for review by the enforcement agency in conjunction with requests for final inspection, and provide copies of the registered CF2R forms to the home owner (see section 2.2.9).

For additional information and details regarding the registration of CF2R documents, refer to Reference Residential Appendix RA2 and Reference Joint Appendix JA7.

2.2.6 Enforcement Agency Field Inspection

§10-103(d)

Local enforcement agency or their representatives, inspect all new buildings to ensure compliance with the Building Standards. Field construction changes and non-complying energy features require parties associated with previous phases to repeat and revise their original energy compliance documents, or re-install building components that meet the building specifications and energy compliance documents.

Enforcement agencies generally make multiple visits to a building site to verify construction. The first visit is typically made just before it is time to pour the slab or the building foundation. At this visit, the building inspector verifies that the proper reinforcing steel is in place and that necessary wiring and plumbing that will be embedded in the slab meets the requirements of the Standards. The inspector should verify features that are to be installed in concrete slab floors, such as slab edge insulation or hot water recirculation loops that involve piping that must be installed in the slab (see Slab Insulation in the Envelope chapter of this manual). The inspector should also verify the front orientation and floor assembly types (i.e. slab on grade, raised floor, etc.) of the building during this phase of construction. Details of how the inspector should verify these components will be discussed further in the Envelope chapter of this manual.

The second visit generally occurs after the walls have been framed, and the HVAC equipment and ducting, fenestration, lighting cans, electrical wiring, plumbing, and other services have been constructed or installed. This inspection is recommended to be made

before the insulation is installed, since it is the best time to assure the completion of sealing and caulking around windows, and the caulking and sealing of any holes bored through the framing members for installation of hot and cold water piping and electrical wiring. During the rough Frame Inspection, it is also best for the inspector to verify the installation of the high efficacy lighting (or the applicable lighting control alternatives) so that the contractor has ample time to make any necessary corrections before the Final Inspection, and to avoid having to remove drywall, insulation, etc. in order to remove an incandescent can. The inspector should also verify the window/skylight U-factor and SHGC values, the proper sealing/installation of HVAC ducts and duct insulation R-value, the installation of exhaust fan housing and ducting in bathrooms and kitchens (ASHRAE 62.2.), installation of a radiant barrier and/or cool roof when required for compliance, etc. during this phase of construction. Details of how the inspector should verify these components will be discussed further in the respective chapters of this manual.

The third visit is the Insulation Inspection, which takes place after the wall, ceiling, and floor insulation has been installed. This inspection occurs before the drywall is installed to verify that the insulation R-value matches the CF1R Form, and that the insulation has been properly installed without compressions, voids, or gaps. The inspector should verify that insulation is installed correctly around and behind piping, and that all exterior walls are insulated (especially behind obstructing objects like a bathtub). Details of how the inspector should verify these components will be discussed further in the Envelope chapter of this manual.

The next visit is usually a drywall Inspection, where the inspector verifies that the drywall is installed properly to limit infiltration and exfiltration, especially at locations surrounding lighting cans, HVAC registers and vents, electrical sockets, etc.

The Final Inspection is conducted after the walls have been closed and the final electrical and plumbing fixtures are in place. The inspector should verify HVAC efficiency values, water heating efficiency values, exhaust fan cfm and sone (noise level) ratings in bathrooms and kitchens (ASHRAE 62.2), exterior lighting and controls, weatherstripping on exterior/demising doors, etc. during this phase of construction. The inspector will also verify that all required CF2R and CF3R forms have been completed, signed, and registered (when applicable), and that copies of all of these forms have been provided to the building owner. Details of how the inspector should verify these components will be discussed further in the respective chapters of this manual.

The typical enforcement agency inspection sequence can vary from jurisdiction to jurisdiction, and it can be difficult for the enforcement agency to verify every energy efficiency measure required to be installed in the building. For example, exterior wall insulation will likely not be installed at the time of the Framing Inspection, and if the enforcement agency does not include the Insulation Inspection in their field inspection process, the exterior wall insulation would be concealed from an inspector's view at the time of the Final Inspection.

For this and other reasons, the Certificate(s) of Installation (CF2R), and when required, the Certificate(s) of Verification (CF3R) are crucial. When inspection of an installed energy

feature would be impossible because of subsequent construction, the enforcement agency may require the CF2R for the concealed feature to be posted at the site or made available to the inspector upon completion/installation of the feature. In these instances, in order to facilitate the inspection process, the inspector would reference the efficiency values and building components specified on the submitted CF2R form to verify compliance with the Building Energy Efficiency Standards.

When registration is required, all Certificate(s) of Installation (CF2R) must be a registered copy from an approved HERS provider data registry. For all measures requiring field verification, a registered Certificate of Verification (CF3R) shall also be made available to the building inspector.

2.2.7 Field Verification and/or Diagnostic Testing

Some building features require field verification and/or diagnostic testing completed by a third party inspector, called a HERS rater, as a condition for compliance with the Standards. The Energy Commission has established the California Home Energy Rating System (HERS) program to provide for the training and certification of HERS raters who are considered special inspectors by enforcement agencies. When compliance with the Building Energy Efficiency Standards is based on energy features that require third party (HERS) verification, a certified HERS rater is required to perform field verification and/or diagnostic testing according to the procedures in Reference Residential Appendix RA2 using the protocols specified in Reference Residential Appendix RA3.

Prescriptive Package A, as well as most performance method software applications, require some sort of field verification and/or diagnostic testing. Most of the typical measures that require HERS field verification and/or diagnostic testing involve air conditioning equipment and forced air ducts that deliver conditioned air to the dwelling. Examples of measures requiring HERS verification are refrigerant charge measurement and duct sealing.

New for the 2013 Building Energy Standards are mandatory HERS measures. Under previous Building Energy Efficiency Standards, all of the HERS requirements were prescriptive measures or compliance options. Now, the 2013 Energy Standards mandate that all newly constructed homes have duct sealing (leakage testing), duct system airflow and fan watt draw (and installed HSPP/PSPP), and exhaust fans/systems (ASHRAE 62.2.) verified by a HERS rater when those systems are installed. With that said, majority of newly constructed homes will require field verification and/or diagnostic testing by a HERS rater per the mandatory measure requirements. Details about these specific HERS measures and others will be discussed in the HVAC (Chapter 4) chapter of this manual.

Additionally, the Prescriptive HERS measure requirements for refrigerant charge testing were amended in the 2013 Building Energy Efficiency Standards for clarity. The Saturation Temperature Measurement Sensors (STMS) requirements were removed and are no longer required when refrigerant charge testing is applicable. An exception was included for the Measurement Access Holes (MAH) requirements for systems where it would be impossible to install such holes. Lastly, the refrigerant charge requirements

were expanded and will be applicable to ducted packaged systems and mini-split systems. Refer to the HVAC (Chapter 4) chapter of this manual for further details.

Additional measures requiring field verification include reduced duct surface area, increased duct R-value, high EER cooling equipment, and quality installation of insulation. For a full list of measures requiring field verification and/or diagnostic testing, refer to Table RA2-1 of the 2013 Reference Residential Appendices. The requirements for field verification and/or diagnostic testing apply only when equipment or systems are installed. For example, if a house has no air distribution ducts, then a HERS rater does not have to test the ducts, since there are no ducts to test.

The HERS rater must perform field verification of the required features and transmit all required data describing the feature and the results of the verification or diagnostic test to an approved HERS provider data registry. The HERS rater must also confirm that the installed energy feature being verified is consistent with the requirements for that feature as specified on registered copies of the CF1R approved by the enforcement agency for the dwelling, and that the information on the CF2R is consistent with the CF1R. The test results reported on the CF2R by the person responsible for the installation must be consistent with the test results determined by the HERS rater's diagnostic verification and meet the criteria for compliance with the Standards. A copy of the registered CF2R must be posted at the building site for review by the enforcement agency, and made available for all applicable inspections. A copy of the registered CF2R must also be left in the dwelling for the home owner at occupancy.

Results from the Rater's field verification or diagnostic test are reported to the HERS provider data registry regardless of whether the result indicates compliance (a “Pass” result) or not (a “Fail” result). If the results indicate compliance, the HERS provider data registry will make available a registered copy of the Certificate of Verification (CF3R). A copy of the registered CF3R must be posted at the building site for review by the enforcement agency, and made available for all applicable inspections. A copy of the CF3R must be provided to the builder, and a copy must also be left in the dwelling for the home owner at occupancy. If field verification and /or diagnostic testing indicates non-compliance (failure) of the measure being verified, that failure must be entered into the HERS provider’s data registry. HERS Providers shall not permit any user of the registry to print or access electronically CF3R forms for non-compliance (failure) entries unless the CF3R form contains a watermark with the word “FAIL” or “FAILURE” making it abundantly clear the result of the test was a failure. Corrective action shall be taken by the builder or installer on the failed measure and the measure shall be retested by the HERS rater to verify that the corrective action was successful. Once determined to be corrected, the passing measure shall be entered into the HERS provider’s data registry.

2.2.8 Approval for Occupancy

In multifamily dwellings of three or more units, the final step in the compliance and enforcement process is the issuance of an occupancy permit by the enforcement agency. This is the “green light” for occupants to move in. Single family dwellings and duplexes may be approved for occupancy without an occupancy permit being issued. Often a

signed-off final inspection serves as an approval for occupancy. When HERS verification is required prior to the approval of occupancy, the HERS rater must post a signed and registered CF3R in the field for the building inspector to verify at final inspection. The HERS rater must also provide a copy of the registered CF3R to the builder, and a copy must be left in the building for the building owner at occupancy. Only registered CF3R documents are allowed for these document submittals. Handwritten versions of the CF3R are not allowed for document submittals with the 2013 Building Energy Efficiency Standards.

2.2.9 Occupancy

At the occupancy phase, the enforcement agency shall require the builder to leave inside the building all completed, signed and dated compliance documentation which includes at a minimum the CF1R and all applicable CF2R forms. When HERS field verification is required, a copy of the registered CF3R is also required to be left on site with the compliance documentation. When registration is required, the CF1R and all required CF2R compliance documentation shall be registered copies as well. The builder is required to provide the homeowner with a manual that contains instructions for operating and maintaining the features of their building efficiently. See Section 2.3.5 for more details.

2.3 Compliance Documentation

Compliance documentation includes the forms, reports and other information that are submitted to the enforcement agency with an application for a building permit. It also includes documentation completed by the contractor or subcontractors to verify that certain systems and equipment have been correctly installed. It may include reports and test results by third-party inspectors (HERS raters). Ultimately, the compliance documentation is included with a homeowner's manual so that the end user knows what energy features are installed in the house.

Compliance documentation is completed at the building permit phase, the construction phase, the field verification and diagnostic testing phase, and at the final phase. The required forms and documents are shown in Table 2-1 and described in the rest of this section in more detail. When registration is required, all of the compliance documentation shall be registered copies from an approved HERS provider data registry.

Table 2-1 – Documentation Requirements, Prescriptive and Performance Compliance Methods

Phase	Method	Documentation Required when applicable
Building Permit	Performance	CF1R-PRF-E, Certificate of Compliance
	Prescriptive	CF1R-NCB-01-E, Certificate of Compliance
	Prescriptive	CF1R-ADD-01-E, Certificate of Compliance Additions less than 1,000 ft2)
	Prescriptive	CF1R-ALT02-E, Certificate of Compliance (Alterations, HVAC changeouts)
	Prescriptive	CF1R-ENV-02-E, Worksheet for area weighted average
	Prescriptive	CF1R-ENV-03-E, Worksheet for solar heat gain coefficient (SHGC)
	Prescriptive	CF1R-ENV-04-E, Worksheet for cool roofs and SRI
	Prescriptive	CF1R-SRA-01-E, Worksheet solar ready areas
	Prescriptive	CF1R-SRA-02-E, Worksheets for minimum solar zone area
	Prescriptive	CF1R-PLB-01-E, Worksheet for hydronic heating systems
	Prescriptive and Performance	CF1R-STH-02-E, Worksheet for OG 300 solar water heating systems
	Prescriptive and Performance	CF1R-STH-02-E, Worksheet for OG 100 solar water heating systems
Construction	Prescriptive and Performance	CF2R-E, Certificate of Installation
	Prescriptive and Performance	CF2R-H,HERS Certificate of Installation
	Prescriptive and Performance	FC-1, Fenestration Certificate for unrated NFRC windows
Field Verification and/or Diagnostic Testing	Prescriptive and Performance	CF3R-H, Certificate of Verification (HERS Rater)
Field Verification and/or Diagnostic Testing	Performance	CF3R-EXC-20-H, Certificate of Verification for Existing Conditions (HERS Rater)
Refer to Appendix A of this manual for a complete list and samples of all energy compliance forms.		

2.3.1 Building Permit Phase Documentation

§10-103(a)

The compliance documentation required at the building permit phase consists of the Certificate of Compliance (CF1R) on the building plans, and depending on the compliance approach, the energy compliance documentation package may also include the Thermal Mass Worksheet (WS1R), the Area Weighted Average Calculation Worksheet (WS2R),

the Solar Heat Gain Coefficient (SHGC) Worksheet (WS3R), and the Solar Water Heating Calculation Form (CFSR). Blank copies of these documents are included in Appendix A of this manual for use with the prescriptive compliance requirements. When the performance approach is used, these worksheet documents are not needed since the Energy Commission-approved software performs the calculations and provides the necessary documentation as part of the software output. However, when the performance approach is used, only the CF1R forms are required on the building plans.

The purpose of the compliance documentation is to enable the plans examiner to verify that the building design shown in the plans and specifications complies with the Building Energy Efficiency Standards, and to enable the field inspector to identify which building features are required for compliance and will be verified in the field.

2.3.2 Certificate of Compliance (CF1R)

The standards require the certificate of compliance to be incorporated into the plans for the building and submitted to the enforcement agency. The CF1R form identifies the minimum energy performance specifications selected by the building designer or building owner for compliance, and may include the results of the heating and cooling load calculations.

To meet the requirement for filing a copy of the CF1R with the plans for the building, builders/contractors should ask the local enforcement agency for information about their preferences or requirements for document submittal procedures. Most local jurisdictions may require the CF1R to be embedded in the building design computer aided drafting (CAD) file for plotting on sheets that are the same size as the building design's plan set sheets, thus the CF1R documentation would be submitted as energy compliance design sheets integral to the entire plan set for the building. On the other hand, some jurisdictions may allow taping CF1R document sheets to the submitted design drawings for the building, while others may allow simply attaching 8-1/2 inch x 11 inch printed CF1R document reports to the submitted design drawing package.

When the prescriptive approach is used for additions and alterations, a short-hand version of the certificate of compliance shall be submitted with the building plans or with the permit application when no plans are required. In these instances: a CF1R-ADD form is required to be submitted for additions; a CF1R-ALT form is required for alterations; and a CF1R-ALT-HVAC form is required for HVAC changeouts. (See Chapter 9 for more details)

For low-rise residential buildings for which compliance requires field verification, the CF1R submitted to the enforcement agency must be a registered copy, from an approved HERS provider data registry. Refer to Reference Residential Appendix RA2 and Reference Joint Appendix JA7 for more information about document registration.

2.3.3 Construction Phase Documentation (CF2R)

§10-103(a)3

The Certificate(s) of Installation (CF2R) are separated into Envelope (CF2R-ENV), Lighting (CF2R-LTG), and Mechanical (CF2R-MECH) categories, and most compliance measures have a separate CF2R form that is specific to a particular installation. The CF2R forms must be completed during the construction or installation phase of the compliance and enforcement process. The CF2R documents must be completed by the applicable contractors who are responsible for installing regulated energy features such as windows (fenestration), the air distribution ducts and the HVAC equipment, the exhaust fans/ventilation system, the measures that affect building envelope tightness, the lighting system, and the insulation. The CF2R must be posted at the job site in a conspicuous location (e.g., in the garage) or kept with the building permit and made available to the enforcement agency upon request. Certificate(s) of Installation will include, but not limited to, the following:

A. **HVAC Systems.** The contractor who installs mechanical equipment signs the applicable Certificate of Installation. Heating and cooling equipment are listed and the energy efficiency, capacity, design loads and other properties of each piece of equipment are documented.
B. **Water Heating Systems.** The Certificate of Installation includes information about the water heating equipment installed in the building, including model number, energy efficiency, tank size, input rating, tank insulation and other properties. The installer also verifies that faucets and shower heads are certified and comply with the Appliance Efficiency Regulations.
C. **Fenestration/Glazing.** The Certificate of Installation is completed and signed by the contractor responsible for installing the windows and skylights. The U-factor, SHGC, area, number of panes, etc. for each window and skylight are documented. . The installer also verifies that all windows and skylights are installed according to the manufacture recommendations .
D. **Insulation Certificate.** The Certificate of Installation is completed and signed by the contractor responsible for installing the insulation. The manufacturer, brand, R-value, etc. of the insulation installed in the roof/ ceiling, walls, floor and slab edge are documented. The installer also verifies compliance with the applicable mandatory measures (i.e. infiltration and exfiltration) for the building envelope.
E. **Duct Leakage and Design Diagnostics.** The Certificate of Installation is signed by the contractor responsible for installing the HVAC air distribution system. The results of duct leakage diagnostic testing, which will later be verified by a third-party inspector (HERS rater), are documented on this form. The duct leakage testing requirements are a mandatory measure under the 2013 Building Energy Efficiency Standards. Refer to Chapter 4 of this manual for more details.
F. **Refrigerant Charge and Airflow Measurement.** The Certificate of Installation is signed by the contractor responsible who verifies that air conditioners and heat pumps have the correct refrigerant charge. This form contains diagnostic data that is later verified by a third-party inspector (HERS rater). The Prescriptive requirements for refrigerant charge and airflow under the 2013 Building Energy

Efficiency Standards were expanded and will be applicable to ducted packaged systems and mini-split systems. See Chapter 4 of this manual for more details.

G. **Duct Location and Area Reduction Diagnostics.** The Certificate of Installation must be completed and signed by the contractor who installs the HVAC air distribution ducts. It verifies that the installed duct system conforms to the duct system design layout that was submitted to the enforcement agency at plan check. The person responsible for the duct system installation must certify on the Certificate of Installation that the installed system features, such as supply register and return grill locations, duct diameters, duct R-values and other duct system design details conform to the requirements for energy compliance credit for improved duct design, as specified on the Certificate of Compliance, approved by the enforcement agency. This form contains system features that will later be verified by a third-party inspector (HERS rater). See Chapter 4 of this manual for more details.

H. **Exhaust Fans/Ventilation Systems.** The Certificate of Installation includes information about the exhaust fans or ventilation system installed to meet the requirements of ASHRAE Standard 62.2. The airflow (cfm), sone rating, duct diameter and length for each exhaust fan are documented. Under the 2013 Energy Efficiency Standards, this form contains test results that will later be verified by a third-party inspector (HERS rater). See Chapter 4 of this manual for more details.

I. **Building Envelope Leakage Diagnostics.** The Certificate of Installation is completed by the contractor responsible for testing building envelope leakage through pressurization of the house. This form contains test results that will later be verified by a third-party inspector (HERS rater). See Chapter 3 of this manual for more details.

J. **Insulation Quality Checklist.** The Certificate of Installation is completed and signed by the insulation contractor when compliance credit is taken for quality insulation installation. Two forms must be completed to verify the proper installation of insulation: one during the rough frame stage of construction, and the second during the insulation phase of construction. This form contains verification results that are later verified by a third-party inspector (HERS rater). See Chapter 3 of this manual for more details.

K. **Lighting Systems.** The Certificate of Installation is completed and signed by the contractor responsible for installing hard-wired lighting systems. The installer verifies compliance with the mandatory requirements for lighting, and whether high efficacy lighting or the alternate controls (occupancy sensors, dimmer switches, etc.) were installed. Kitchen lighting and cabinet lighting wattages are indicated on this form when applicable. See Chapter 6 of this manual for more details.

When field verification and/or diagnostic testing of a feature is required for compliance (as shown in the HERS Required Verification section of the CF1R), the builder or the builder's subcontractor must perform the initial field verification or diagnostic testing of the installation to confirm and document on the applicable CF2R compliance with the Standards utilizing the applicable procedures specified in Reference Residential Appendix

RA3. The builder, the builder's subcontractor, or authorized representative must submit the CF2R information to an approved HERS provider data registry. All CF2R information submittals must be done electronically (registration) when HERS verification/testing is required.

HERS raters or other authorized users of the HERS provider data registry shall be allowed to facilitate the transmittal/submittal of the Certificate(s) of Installation information to the HERS provider data registry website on behalf of the builder or the builder's subcontractor when such facilitation has been authorized by the builder or subcontractor. However, the builder or subcontractor responsible for the installation is still required to sign/certify the completed Certificate of Installation (CF2R) to confirm the accuracy of the information, and confirm that the installation complies with the requirements shown on the Certificate of Compliance (CF1R) for the building.

After submittal the Certificate of Installation information to the HERS provider data registry, the builder or subcontractor must access the registered Certificate of Installation from the provider data registry, submit an electronic certification/signature to the registry, and provide a copy to the HERS rater. The registered copy submitted to the HERS rater may be in paper or electronic format, or the HERS rater may access the completed, signed and registered copy of the Certificate of Installation directly from the registry.

After providing the HERS rater a copy (or access to in the registry) of the Certificate of Installation, the builder or subcontractor shall provide a copy of the completed, signed, and registered Certificate of Installation at the building site for review by the enforcement agency in conjunction with requests for final inspection for each dwelling unit. The builder or subcontractor shall also leave a copy of the completed and registered CF2R, along with the homeowners' manual (see section 2.3.5 for details), in the building for the building owner to receive at occupancy.

2.3.4 Field Verification and/or Diagnostic Testing Documentation (CF3R)

§10-103(a)5

For the 2013 Building Energy Efficiency Standards, some of the mandatory measures, some of the prescriptive requirements, and some of the measures that may be used for compliance in the performance approach may require field verification and/or diagnostic testing. This must be performed by a third-party inspector who is specially trained and independent from the builder or general contractor. The Energy Commission recognizes HERS raters for this purpose.

When field verification and/or diagnostic testing is required, the *Certificate of Verification* (CF3R) must be completed, registered, and signed/certified by the HERS rater. The CF3R documents include information about the measurements, tests, and field verification results that were required to be performed. The HERS rater must verify that the requirements for compliance have been met.

The HERS rater who has been chosen for the project must transmit the CF3R information to an approved HERS provider data registry. This must be the same HERS provider data

registry through which the previous compliance documents (CF1R, CF2R) for the project were registered. The HERS rater used for the project must be certified by the HERS Provider whose registry the project has been entered into. A registered CF3R from the provider that has been signed or certified by the rater is made available to the enforcement agency and to the builder when HERS verification confirms compliance. The builder is ultimately responsible for ensuring that the enforcement agency has received the CF3R prior to the occupancy permit or final inspection.

Raters shall provide a separate registered CF3R form for each house that the rater determines has met the verification or diagnostic requirements for compliance. The HERS rater shall not sign a CF3R for a house that does not have a registered CF2R that has been signed/certified by the installer. If the building was approved as part of a sample group, the CF3R will include additional information that identifies whether the building was a tested or a "not tested" building from the sample group. The CF3R form for the tested home of a sample group will include the test/verification results, but the “not tested” homes will not. CF3R forms for “not tested” homes in a sample group will still have a registration number, date, time, etc. and a watermark of the HERS Provider’s seal. Refer to Reference Residential Appendix RA2 for more details on HERS verification and CF3R documentation procedures.

2.3.5 Compliance, Operating, and Maintenance, and Ventilation Information to be Provided by Builder

§10-103(b)

The final documentation in the compliance and enforcement process is the information that is provided to the homeowner. At the completion of construction and prior to occupancy, the enforcement agency shall require the builder to leave in the building the applicable completed, signed and dated compliance documentation including, at a minimum, the applicable CF1R forms, CF2R forms, and if compliance required HERS verification, the applicable CF3R forms. When registration is required, all of these compliance documents shall be registered copies. In addition to the compliance documentation, the builder must leave in the building all operating and maintenance information for all installed features, materials, components, and manufactured devices. The operating and maintenance information must contain the details needed to provide the building owner/occupant with instructions on how to operate the home in an energy-efficient manner and to maintain it so that it will continue to work efficiently into the future.

For individually-owned units in a multifamily building, the documentation must be provided to the owner of the dwelling unit or to the individual(s) responsible for operating the feature, equipment, or device. Information must be for the appropriate dwelling unit or building (paper or electronic copies of these documents are acceptable).

Example 2-1

Question

What are the plan checking/field inspection requirements related to the CF-2R?

Answer The CF2R (Certificate of Installation) is not submitted with compliance documentation at the time of permit application, but rather is posted or made available for field inspection after installation. A field inspector should check the equipment that is actually installed against what is listed on the CF2R, and compare the CF2R and CF1R for consistent equipment characteristics. The field inspector should do this for all installed building components indicated on a CF2R form (HVAC, fenestration, insulation, water heating, etc.).

When HERS verification is required for compliance, the field inspector should check the HERS Required Verification listings on the CF1R to identify the required installer tests, and verify that these tests were performed and documented on the applicable Certificate(s) of Installation (CF2R).

The enforcement agency may request additional information to verify that the installed efficiency measures are consistent with the approved plans and specifications. When material properties or equipment efficiencies greater than the minimum requirements are shown on the CF1R, the enforcement agency may have procedures for verification of the actual material or equipment specifications. For example, the enforcement agency may require the installer to provide a copy of the applicable page(s) from a directory of certified equipment.

Example 2-2

Question

What happens to the CF2R after the final inspection?

Answer

§10-103(b) requires the builder to leave a copy of the CF2R in the building for the building owner at occupancy.

Example 2-3

Question

As a general contractor, when I have finished building a residence, is there a list of materials I am supposed to give to the building owner?

Answer

§10-103(b) requires that at final inspection the enforcement agency shall require the builder to leave compliance, operating, maintenance, and ventilation information in the building for the "building owner at occupancy," which includes the following:

1. Certificate of Compliance (CF1R);

2. Certificate(s) of Installation (CF2R);

3. Certificate(s) of Verification (CF3R) if applicable;

4. Operating information for all applicable features, materials, components, and mechanical devices installed in the building; and

5. Maintenance information for all applicable features, materials, components, and manufactured devices that require routine maintenance for efficient operation.

Example 2-4

Question

I built some multifamily buildings and have some questions about the information I must provide to the building owner at occupancy (as required by §10-103(b)). Specifically:

If the building is a condominium, can I photocopy the same CF1R information for all units?

When the building is an apartment complex (not individually-owned units), who gets the documentation?

If an apartment is converted to condominiums, does each owner/ occupant receive copies of the documentation?

Answer

Photocopied information is acceptable. It must be obvious that the CF1R documentation applies to that dwelling unit. That is, the features installed must match the features shown on the Certificate(s) of Installation (CF2R). If the CF1R compliance documentation is for a "whole building," a photocopy of the CF1R compliance form for that building must be provided. If individual compliance is shown for each unique dwelling unit, a photocopy of the documentation that applies to that dwelling unit must be provided. The copies may be in paper or electronic format.

The documentation and operating information is provided to whoever is responsible for operating the feature, equipment, or device (typically the occupant). Maintenance information is provided to whoever is responsible for maintaining the feature, equipment or device. This is either the owner or a building manager (§10-103(b)).

If, during construction, the building changes from an apartment to condominiums, each owner at occupancy would receive the documentation. If an existing apartment building changes to condominiums at a later date, the documentation requirements are triggered only by a building permit application requiring compliance with the Building Energy Efficiency Standards (changing occupancy does not trigger compliance with the Standards).

2.4 Roles and Responsibilities

2.4.1 Designer

5537 and 6737.1 of California Business and Professions Code

The designer is the person responsible for the overall building design. As such, the designer is responsible for specifying the building features that determine compliance with the Building Energy Efficiency Standards and other applicable building codes. The designer is required to provide a signature on the Certificate of Compliance (CF1R) to certify that the building has been designed to comply with the Building Energy Efficiency Standards.

The designer may personally prepare the Certificate of Compliance documents, or may delegate preparation of the energy analysis and Certificate of Compliance documents to an energy documentation author or energy consultant. If preparation of the building energy Certificate of Compliance documentation is delegated, the designer must remain in responsible charge of the building design specifications, energy calculations, and all building feature information represented on the Certificate of Compliance. The designer's signature on the Certificate of Compliance affirms his or her responsibility for the information submitted on the Certificate of Compliance.

The designer may be an architect, engineer or other California-licensed professional; however, a licensed design professional may not always be required for low-rise residential buildings. The California Business and Professions Code allows unlicensed designers to prepare design documentation for wood-framed single family dwellings as long as the dwellings are no more than two stories in height (not counting a possible basement). Two-story wood-framed multifamily buildings may also be designed by unlicensed designers as long as the building has four or fewer dwelling units. When the designer is a licensed professional, the signature block on the Certificate of Compliance must include the designer's license number.

When Certificate of Compliance document registration is required, the Certificate of Compliance must be submitted to an approved HERS provider data registry. All submittals to the HERS provider data registry must be made electronically.

2.4.2 Documentation Author

§10-103(a)1

The person responsible for the design of the building may delegate the energy analysis and preparation of the Certificate of Compliance documentation to a building energy consultant or documentation author. A completed Certificate of Compliance must be submitted to the enforcement agency during the building permit phase. The Certificate of Compliance demonstrates to the enforcement agency plan checker that the building design complies with the requirements of the Building Energy Efficiency Standards, thus the building energy features information submitted on the Certificate of Compliance must be consistent with the building design features defined in the plans and specifications for the building submitted to the enforcement agency.

The documentation author is not subject to the same limitations and restrictions of the *Business and Professions Code* as is the building designer because the documentation author is not responsible for specification of the building design features. The documentation author may provide the building designer with recommendations for building energy features and if those recommendations are approved by the building designer, the features must be incorporated into the building design plans and specification documents submitted to the enforcement agency at plan check. The documentation author's signature on the Certificate of Compliance certifies that the documentation he or she has prepared is accurate and complete, but does not indicate documentation author responsibility for the specification of the features that define the building design. The documentation author provides completed Certificate of Compliance

documents to the building designer who must sign the Certificate of Compliance prior to submittal of the Certificate of Compliance to the enforcement agency at plan check.

If registration of the Certificate of Compliance is required, the Certificate of Compliance must be submitted to the HERS provider data registry and signed electronically by both the designer and documentation author prior to submittal to the enforcement agency. When document registration is required, only registered Certificates of Compliance that display the registration number assigned to the certificate by an approved HERS provider data registry are acceptable for submittal to the enforcement agency at plan check.

For a list of qualified documentation authors, visit the *California Association of Building Energy Consultants' (CABEC)* website at: http://www.cabec.org/ceperosterall.php

2.4.3 Builder or General Contractor

The term builder refers to the general contractor responsible for construction. For production homes, the builder may also be the developer with responsibility for arranging financing, acquiring the land, subdividing the property, securing the necessary land planning approvals and attending to the other necessary tasks that are required prior to actual construction. Many production builders are also involved in the marketing and sales of homes after they are constructed.

During the construction process, the builder or general contractor usually hires specialty subcontractors to provide specific services, such as installing insulation, designing and installing HVAC systems, installing windows and skylights, installing water heating systems, etc. For homes that do not require a licensed design professional, the builder may sign the Certificate of Compliance (CF1R) in the "Responsible Building Designer's" signature block.

The builder or general contractor must ensure that Certificate(s) of Installation (CF2R) are submitted to the enforcement agency by the person(s) responsible for construction/installation of regulated features, materials, components, or manufactured devices. The builder or general contractor may sign the Certificate of Installation on behalf of the specialty subcontractors they hire, but generally, Certificate of Installation preparation and signature responsibility resides with the specialty subcontractor who provided the installation services. The Certificate of Installation document identifies the installed features, materials, components, or manufactured devices detailed in the plans and specifications, and the Certificate(s) of Compliance approved by the local enforcement agency. If the installation requires field verification and diagnostic testing by a HERS rater, the Certificate of Installation must report the results of any of the installer's required testing of the regulated installations to measure their performance, and the CF2R shall be submitted to an approved HERS provider data registry. A copy of the registered Certificate of Installation is required to be posted at the building site for review by the enforcement agency in conjunction with requests for final inspection.

When the Building Energy Efficiency Standards require registration of the compliance documents, the builder or general contractor must ensure the transmittal/submittal of the

required CF1R information to an approved HERS provider data registry. The builder or general contractor must make arrangements for the services of a certified HERS rater if the Certificate of Compliance indicates that third-party field verification and diagnostic testing by a HERS rater is required. The builder or general contractor must ensure that a copy of the Certificate of Compliance that was approved by the designer/owner and submitted to the enforcement agency during the permitting phase is transmitted to the HERS provider data registry and made available to the HERS rater who will perform any required field verification and diagnostic testing.

When installation work is complete, the builder or general contractor must ensure that the persons responsible for the installation work have transmitted/submitted the required Certificate of Installation information to the HERS provider data registry. Additionally, the builder must ensure that the HERS rater receives a copy of the completed Certificate of Installation (CF2R), or provide access to in the data registry, that has been registered and signed by the builder or subcontractors responsible for the installation that is to be verified by the HERS rater. When registration of the Certificate of Installation is required, the completed and signed copies that are posted at the building site for review by the enforcement agency, in conjunction with requests for final inspection, are required to be registered copies.

At final inspection, the builder or general contractor is required to leave in the building all applicable completed, signed, dated, and registered (when applicable) compliance documents for the building owner at occupancy. Such information must, at a minimum, include information indicated on the following forms: Certificate of Compliance (CF1R); Certificate(s) of Installation (CF2R); and for buildings for which compliance requires HERS field verification, Certificate(s) of Verification (CF3R). These forms must be in paper or electronic format and must conform to the applicable requirements of §10-103(a).

2.4.4 Specialty Subcontractors

Specialty subcontractors provide the builder with services from specific building construction trades for installation of features such as wall and ceiling insulation, windows, HVAC systems and/or duct systems, water heating and plumbing systems, and these subcontractors may perform other trade-specific specialty services during the building construction process. The builder has ultimate responsibility for all aspects of the building's construction and has the authority to complete and sign/certify all sections of the required Certificate(s) of Installation (CF2R) forms. However, the licensed specialty subcontractor should be expected to complete and sign/certify all applicable Certificate(s) of Installation that document the completion of the installation work they have performed for the builder. The subcontractor's responsibility for Certificate of Installation documentation should include providing a registered (when applicable) and signed copy of all applicable CF2R's to the builder, posting a registered (when applicable) and signed copy of all applicable CF2R's at the building site for review by the enforcement agency, and making available to the HERS rater the registered and signed copies of the applicable CF2R's if HERS third-party field verification is required for compliance, as specified on the Certificate of Compliance (CF1R).

When the Standards require document registration, all copies of the Certificate(s) of Installation documentation submitted to the builder, the enforcement agency, and the HERS rater are required to be registered copies prepared in accordance with the procedures described in Reference Residential Appendix RA2, Reference Joint Appendix JA7, and Section 2.3 of this manual.

2.4.5 Enforcement Agency

§10-103

The enforcement agency is the local agency with responsibility and authority to issue building permits and verify compliance with applicable codes and standards. The enforcement agency performs several key roles in the compliance and enforcement process.

Plan check: The enforcement agency performs plan check review of the Certificate(s) of Compliance documentation and of the plans and specifications that define the building design submitted to the enforcement agency at the building permit phase. During plan check, the Certificate of Compliance documentation is compared to the plans and specifications for the building design in order to confirm that the building features that describe the building are specified consistently in all of the documents submitted. If the specification for building design features shown on the Certificate of Compliance does not conform to the specifications shown on the designer's submitted plans and specifications for the building, revision of the submitted documents must be performed to make the design specification consistent in all documents. Thus, if the Certificate of Compliance indicates the building complies, and the features on the Certificate of Compliance are consistent with the features given in the plans and specifications for the building design, then the plan check process can confirm that the building design complies with the building energy code. If it is determined that the building design is in compliance with the building energy code, in addition to all of the other building codes, the enforcement agency may issue a building permit. When the Standards require document registration, the Certificate of Compliance documentation that is submitted to plan check must be a registered document from an approved HERS provider data registry.

Construction inspection: During the construction of the building, the enforcement agency should make several visits to the construction site to verify that the building is being constructed in accordance with the approved plans and specifications, and energy compliance documentation. As part of this process, at each site visit, the enforcement agency should review any applicable Certificate(s) of Installation that have been posted or made available with the building permit(s). The enforcement agency should confirm that the energy efficiency features installed in the house are consistent with the requirements given in the plans and specifications for the building approved during plan check; that the installed features are described accurately on the Certificate(s) of Installation; and that all applicable sections of the Certificate(s) of Installation have been signed by the responsible licensed person(s). The enforcement agency shall not approve a dwelling unit until the enforcement agency has received all applicable Certificate(s) of Installation. When the Standards require registration of the energy compliance documents, the Certificate(s) of

Installation documentation must be registered with an approved HERS provider data registry.

Corroboration of field verification and diagnostic testing procedures: As described in Reference Residential Appendix Section RA2.4.4, at its discretion, the enforcement agency may require that field verification and diagnostic testing performed by the builder or subcontractors or the certified HERS rater must be scheduled to be performed at a time when the enforcement agency's field inspector can observe the verification or test procedures to corroborate the results reported/documented on the Certificate(s) of Installation (CF2R) and/or the Certificate(s) of Verification (CF3R).

Sampling within enforcement agency jurisdictions: When sampling is utilized for HERS verification compliance for *newly constructed buildings*, all dwellings in a designated sample group must be located within the same enforcement agency jurisdiction and subdivision or multifamily housing development, as specified in Reference Residential Appendix Section RA2.6.3.1

When sampling is utilized for HERS verification compliance for *alterations*, the dwellings in a designated sample group are not required to be located within the same enforcement agency jurisdiction, and the building owner may choose for the field verification and diagnostic testing to be completed as part of a designated sample group composed of dwelling units for which the same installing company has completed the work that requires field verification and diagnostic testing for compliance, as specified in Reference Residential Appendix Section RA2.8. However, to enable the enforcement agency to schedule testing to accomplish the corroboration described in the previous section, the enforcement agency may choose to require that a separate dwelling unit from the sample group that is located within its jurisdiction be tested.

Final approval: The enforcement agency may approve the dwelling at the final inspection phase of the process if the enforcement agency field inspector determines that the dwelling conforms to the requirements of the building's plans and specifications and Certificate of Compliance documents approved by the enforcement agency at plan check, and meets the requirements of all other applicable codes and standards. For dwelling units that have used an energy efficiency compliance feature that requires Certificate of Installation documentation, the enforcement agency shall not approve the dwelling unit until the enforcement agency has received a Certificate of Installation that meets the requirements of §10-103(a) that has been completed, signed, and registered (when applicable) by the builder or subcontractor.

For dwelling units that require third party HERS field verification and diagnostic testing for compliance, the enforcement agency shall not approve the dwelling unit until the enforcement agency has received a registered copy of the Certificate of Verification that meets the requirements of §10-103(a) that has been signed and dated by the HERS rater. The builder must ultimately take responsibility to ensure that all such required energy compliance documentation has been completed properly and posted at the job site or submitted to the enforcement agency in conjunction with any of the enforcement agency's required inspections. However, the enforcement agency, in accordance with §10-103(d),

as prerequisite to approval of the building, must examine all required copies of Certificate(s) of Installation (CF2R) documentation and Certificate(s) of Verification (CF3R) documentation posted at the site or made available with the building permits for the required inspections, to confirm that they have been properly prepared and are consistent with the plans and specifications and the Certificate of Compliance documentation approved by the enforcement agency for the building at plan check.

When an alteration has been performed by a participating Third Party Quality Control Program (TPQCP) contractor (see section 2.4.8 of this manual), the enforcement agency may conditionally approve the building based on the Certificate of Installation (CF2R) if the TPQCP data checking has indicated that the installation complies. However, if subsequent HERS compliance verification procedures determine that re-sampling, full testing or corrective action is necessary for such conditionally approved dwellings in the group, the corrective work must be completed. Refer to Reference Residential Appendix RA2.4.3, RA2.7, and RA2.8 for additional information on TPQCP requirements.

Corroboration of information provided for the owner/occupant: At final inspection, the enforcement agency shall require the builder to leave in the building (for the building owner at occupancy) energy compliance, operating, maintenance, and ventilation information documentation as specified by §10-103(b).

Compliance documents for the building shall, at a minimum, include information indicated on forms: Certificate of Compliance (CF1R); Certificate(s) of Installation (CF2R); and, for buildings for which compliance requires HERS field verification, Certificate(s) of Verification (CF3R). These forms shall be copies of the documentation submitted to or approved by the enforcement agency, and the copies must conform to the applicable requirements of §10-103(a).

Operating information shall include instructions on how to operate or maintain the buildings energy features, materials, components, and mechanical devices correctly and efficiently. Such information shall be contained in a folder or manual which provides all information specified in §10-103(b). This operating information shall be in paper or electronic format. For dwelling units, buildings or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for operating the feature, material, component, or mechanical device installed in the building. This operating information shall be in paper or electronic format.

Maintenance information shall be provided for all features, materials, components, and manufactured devices that require routine maintenance for efficient operation. Required routine maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label may be limited to identifying, by title and/or publication number, the operation and maintenance manual for that particular model and type of feature, material, component, or manufactured device. For dwelling units, buildings or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for maintaining the feature,

material, component, or mechanical device installed in the building. This maintenance information shall be in paper or electronic format.

Ventilation information shall include a description of the quantities of outdoor air that the ventilation system(s) are designed to provide to the building's conditioned space, and instructions for proper operation and maintenance of the ventilation system. For buildings or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for operating and maintaining the feature, material, component, or mechanical ventilation device installed in the building. This information shall be in paper or electronic format.

Example 2-5

Question:

We are an enforcement agency with jurisdiction over the replacement of an HVAC unit's outdoor compressor/condenser unit (an alteration), and the HVAC contractor who pulled the permit for replacing the unit has requested that we approve the final inspection and close out the permit based only on the Certificate of Installation (CF2R) for this job. This job requires HERS verification, and I thought it was necessary to receive the HERS rater's completed and signed Certificate of Verification (CF3R) before the job could be considered to be in compliance as a condition to final approval of the installation. Is there an allowance for compliance based only on the CF2R?

Answer:

Yes. The enforcement agency may provide a "conditional" final approval of the installation based upon the CF2R for alterations jobs only, and only if the installing contractor is an approved Third Party Quality Control Program (TPQCP) installing contractor. The conditional final approval is allowed if TPQCP data checking has scrutinized the diagnostic test data submitted by the approved contractor's diagnostic test for the installation, and such data checking indicates the installation complies as shown on the CF2R.

The permittee is still required to complete all HERS verification procedures and comply with all HERS verification criteria and a CF3R is still required to be submitted to the enforcement agency, builder, and home owner in order for the documentation procedure to be complete.

If HERS verification of the approved TPQCP contractor's installation work determines that re-sampling, full testing, or corrective action is necessary to bring the installation into compliance, such work must be completed prior to issuance of the CF3R. Sampling procedures for HERS verification for installation work performed by an approved TPQCP contractor allows for testing of one sample from a designated group of up to 30 dwellings/installations for which the work was performed by the same approved TPQCP installing contactor. Refer to Reference Residential Appendix Sections RA2.4.3, RA2.7 and RA2.8 (and Chapter 9 of this manual) for additional information on Third Party Quality Control Programs and conditional approvals for alterations that use approved TPQCP contractors.

2.4.6 HERS Provider

http://www.cheers.org
http://www.calcerts.com
http://www.cbpca-hers.org

A HERS provider is an organization that the Energy Commission has approved to administer a HERS program. A HERS provider has responsibility to certify and train raters and maintain quality control over the activities performed by the HERS raters who provide third-party field verification and diagnostic testing on installed energy efficiency features in dwellings when required for compliance with the Building Energy Efficiency Standards. In California, the certified HERS providers currently are: ConSol Home Energy Efficiency Rating System (CHEERS); California Certified Energy Rating & Testing Services (CalCERTS); and U.S. Energy Raters Association (USERA) who was formerly CBPCA.

The HERS provider must maintain a database (data registry) that incorporates an internet website-based user interface that has sufficient functionality to accommodate the needs of the authorized users of the data registry who must participate in the administration of HERS compliance, document registration, and Building Energy Efficiency Standards enforcement activities. The data registry must receive and record information that can adequately identify and track measures that require HERS verification in a specific dwelling, and must have the capability to determine compliance based on the information input from the results of applicable testing or verification procedures reported as input to the data registry for the dwelling. When the requirements for compliance are met, the data registry must make available a unique "registered" certificate for use in complying with document submittal requirements to enforcement agencies, builders, building owners, HERS raters, and other interested parties. Under the 2013 Building Energy Efficiency Standards, the data registry must have the capability to facilitate electronic submittal of the registered certificates to an Energy Commission document repository for retention of the certificates for use in enforcement of the regulations.

The HERS provider must make available via phone or internet communications interface a way for building officials, builders, HERS raters, and other authorized users of the provider's data registry to verify the information displayed on copies of the submitted compliance documentation. Refer to Reference Residential Appendices Section RA2.4.2 and Reference Joint Appendix JA7 for additional information describing the HERS provider's role and responsibilities.

2.4.7 HERS Rater

The HERS rater is trained and certified by an Energy Commission-approved HERS provider to perform the field verification and diagnostic testing that may be required to demonstrate and document compliance with the Building Energy Efficiency Standards. HERS raters receive special training in diagnostic techniques and building science as part of the HERS rater certification process administered by the HERS provider; thus HERS raters are to be considered special inspectors by enforcement agencies and shall

demonstrate competence, to the satisfaction of the enforcement agency, to conduct the required visual inspections and diagnostic testing of the regulated energy efficiency features installed in the dwelling.

HERS raters should be cognizant that some enforcement agencies charge a fee for special inspectors in their jurisdictions, and because HERS raters are deemed to be special inspectors for the enforcement agency, a HERS rater may be disciplined (e.g., prohibit a HERS rater from conducting field verifications/testing in a local jurisdiction) if the enforcement agency determines that a HERS rater willingly or negligently does not comply with the Building Energy Efficiency Standards. HERS raters may also be required to attain business licenses in some jurisdictions.

If the documentation author who produced the Certificate of Compliance documentation for the dwelling is not an employee of the builder or subcontractor, the documentation author for the dwelling may also act to perform the responsibilities of a HERS rater, provided the documentation author has met the requirements and has been certified as a HERS rater, and is associated with one of the Energy Commission-approved HERS providers.

If requested to do so by the builder or subcontractor, the HERS rater may assist the builder or subcontractor in transmitting/submitting the Certificate(s) of Installation (CF2R) information to the HERS provider for registration. However, the HERS rater may not certify the information on a Certificate of Installation. The builder or subcontractor responsible for the installation must provide the Certificate of Installation certification/signature to confirm the information submitted to the HERS provider data registry, even if the HERS rater has assisted with transmittal of the data. Refer to Reference Residential Appendix Section RA2.5 and Reference Joint Appendix JA7 for more information that describes these procedures for document registration for which the HERS rater may assist the builder or subcontractor.

The HERS rater is responsible for conducting the field verification and diagnostic testing of the installed special features when required by the Certificate of Compliance (CF1R). The HERS rater must transmit the results of the field verification and diagnostic testing to the HERS provider data registry. The HERS rater must provide to the data registry all information required to complete the Certificate(s) of Verification (CF3R) form, and must also submit a certification/signature to the data registry. Whereupon, the data registry will make available registered copies of the Certificate(s) of Verification (CF3R) to the HERS rater, the builder, the enforcement agency, and other authorized users of the HERS provider's data registry. Printed copies, electronic or scanned copies, and photocopies of the completed, signed, and registered Certificate(s) of Verification (CF3R) are allowed for document submittals, subject to verification that the information contained on the copy conforms to the registered document information currently on file in the HERS provider data registry for the dwelling. A completed, signed, and registered copy of the Certificate(s) of Verification (CF3R) must be posted at the building site or made available to the inspector for review by the enforcement agency in conjunction with requests for final inspection for each dwelling unit.

For more information on the roles and responsibilities for HERS raters, refer to Reference Residential Appendix Section RA2.4.2.

Example 2-6

Question:

May a certified HERS rater who does the field verification and completes and signs the CF3R for a dwelling also perform the testing required of the builder or installer to certify compliance with the Title 24, Part 6 installation requirements on the CF2R?

Answer:

Yes. This approach is allowed when the HERS rater is doing field verification for every dwelling (100% testing), but it is not allowed when the HERS rater performs verification utilizing a designated sample group of dwellings. When 100% testing is utilized for HERS verification,

the builder or the installer may utilize the information from the HERS rater's verification or diagnostic test results when completing the CF2R; but when doing so, the builder or installer must be aware that when they sign the certification statement on the CF2R they are assuming responsibility for the information content on the CF2R and are certifying that the installation conforms to all applicable codes and regulations. The HERS rater may not sign the CF2R form and cannot be assigned the responsibilities of the builder or installer as stated on the CF2R form and in regulations.

If the HERS rater determines that the compliance requirements are not met, the HERS rater will submit the data of the failed verification/testing into a HERS Provider data registry for retention, and the builder or installer must take corrective action to make whatever corrections are necessary. Once corrections have been made and the HERS rater determines that all compliance requirements are met, the builder or installer may certify the work by completing and signing the applicable section of the CF2R, and the HERS rater can complete the CF3R documentation for the dwelling.

Example 2-7

Question

I heard that there are conflict-of-interest requirements that HERS raters must abide by when doing field verification and diagnostic testing. What are these requirements?

Answer

HERS raters are expected to be objective, independent, third parties when they are fulfilling their duties as field verifiers and diagnostic testers. In this role, they are serving as special inspectors for local enforcement agencies. By law, HERS raters must be independent entities from the builder or subcontractor installer of the energy efficiency features being tested and verified. They can have no financial interest in the installation of the improvements. HERS raters cannot be employees of the builder or subcontractor whose work they are verifying. Also, HERS raters cannot have a financial interest in the builder's or contractor's business, or advocate or recommend the use of any product or service that they are verifying.

The Energy Commission expects HERS raters to enter into a contract with the builder (not with sub-contractors) to provide independent, third-party diagnostic testing and field verification. The procedures adopted by the Energy Commission call for direct reporting of results to the builder, the HERS provider, and the building official. Although not recommended by the Energy Commission, a “three-party contract” between builder, HERS rater and sub-contractor is possible, provided that the contract delineates both the independent responsibilities of the HERS rater and the responsibilities of a sub-contractor to take corrective action in response to deficiencies that are found by the HERS rater. Such “three-party contracts” may also establish the role for a sub-contractor to serve as contract administrator for the contract, including scheduling the HERS rater, invoicing, and payment, provided the contract ensures that monies paid by the builder to the HERS rater can be traced through audit. It is critical that such “three-party contracts” preserve the rater's independence in carrying out the responsibilities specified in Energy Commission-adopted HERS field verification and diagnostic testing procedures. Even though such “three-party contracts” are not on their face in violation of the requirements of the Energy Commission, the closer the working relationship between the HERS rater and the sub-contractor whose work is being inspected, the greater the potential for compromising the independence of the HERS rater.

Compliance cannot be shown using sampling if a "three-party contract" is used. 100% of homes must be tested by a HERS rater when a three-party contract is used. HERS raters must use their own diagnostic equipment (cannot use the installing contractor's diagnostic equipment) when verifying work performed when a three-party contract is used.

(See Blueprint #66, pp. 1-2, and Blueprint #67, p. 7)

CHEERS, CalCERTS and USERA have been approved by the Energy Commission to serve as HERS providers to certify and oversee HERS raters throughout the state.

These HERS providers are required to provide ongoing monitoring of the propriety and accuracy of HERS raters in the performance of their duties and to respond to complaints about HERS rater performance. In cases where there may be real or perceived compromising of HERS rater independence, they are responsible for providing increased scrutiny of the HERS rater, and taking action to ensure objective, accurate reporting of diagnostic testing and field verification results, in compliance with Energy Commission adopted procedures.

Enforcement agencies have authority to require HERS raters to demonstrate their competence to the satisfaction of the building official. Therefore, in situations where the independence of the HERS rater is in question, building officials can prohibit a particular HERS rater from being used in their jurisdiction, or disallow HERS rater practices that the building official believes will compromise the HERS rater's independence. Building officials may require the use of a three-party contract. For additional information about three-party contracts, please contact the Energy Commission Hotline.

2.4.8 Third Party Quality Control Program

The Energy Commission may approve Third Party Quality Control Programs (TPQCP) that serve some of the functions of HERS raters for field verification purposes but do not have the authority to sign compliance documentation as a HERS rater. Third Party Quality Control Programs:

A. Provide training to installers, participating program installing contractors, installing technicians and specialty Third Party Quality Control Program subcontractors regarding compliance requirements for measures for which diagnostic testing and field verification is required.

B. Collect data from participating installers for each installation completed for compliance credit.
C. Perform data checking analysis of information from diagnostic testing performed on participating TPQCP contractor installation work to evaluate the validity and accuracy of the data and to independently determine whether compliance has been achieved.
D. Provide direction to the installer to retest and correct problems when data checking determines that compliance has not been achieved.
E. Require resubmission of data when retesting and correction is directed.
F. Maintain a database of all data submitted by the participating TPQCP contractor in a format that is acceptable and made available to the Energy Commission upon request.

The HERS provider must arrange for the services of an independent HERS rater to conduct independent field verifications of the installation work performed by the participating TPQCP contractor and Third Party Quality Control Program. If group sampling is utilized for HERS verification compliance for jobs completed by a participating TPQCP contractor, the sample from the group that is tested for compliance by the HERS rater may be selected from a group composed of up to 30 dwellings for which the same participating TPQCP contractor has performed the installation work. For alterations, the installation work performed by TPQCP contractors may be approved at the enforcement agency's discretion, based upon a properly completed Certificate of Installation (CF2R) as described in Section 2.4.5, on the condition that if subsequent HERS compliance verification procedures determine that re-sampling, full testing or corrective action is necessary for such conditionally approved dwellings in the group, the corrective work must be completed. If the Standards require registration of the Certificate of Installation, the certificate must be a registered copy from a HERS provider data registry.

Refer to Reference Residential Appendix RA2.4.3, RA2.7, and RA2.8 for additional information about the Third Party Quality Control Program, and for additional information about document registration.

2.4.9 Owner

Building owner means the owner of the dwelling unit. In the context of production homes, the owner is the person or family that the builder sells the house to. In custom homes and remodels, the owner may be the “builder” or developer, and a general contractor, architect, or engineer, etc. may be in their employment.

As part of the compliance process, the owner must receive Compliance, Operating, Maintenance, and Ventilation information documents at the time of occupancy. The enforcement agency must require the builder to leave this information in the building for the building owner at occupancy as specified in §10-103(b).

Example 2-8

Question

What is my responsibility with respect to the CF2R (Certificate of Installation) as: (a) an enforcement agency inspector; and (b) as a builder?

Answer

(a)The enforcement agency field inspector is responsible for verifying that the required CF2R form(s) are filled out completely and in conformance with the requirements of §10-103(d) during applicable site inspections, which includes verifying the CF2R is registered when required by the Standards, and confirming that the person responsible for the installation has signed the certificate. Inspectors must verify that the installed features conform to the plans and specifications and the Certificate of Compliance approved by the enforcement agency.

The CF2R is required to be posted at the job site or kept with the building permit, and must be made available for all applicable inspections. The enforcement agency field inspector should verify Certificate(s) of Installation during the applicable site inspections (e.g. verifying the Certificates of Installation for Quality Insulation Installation, QII, at the framing and insulation inspections). It is not advisable to wait until the final inspection to check all CF2R documentation.

(b)The general contractor or his/her agent (e.g. the installing contractor) must take responsibility for completing and signing the CF2R form for the work performed. A homeowner acting as the general contractor for a project is authorized to sign the CF2R; however, the installing contractor should provide the certification since the CF2R certification statement is an installer's assurance to the owner that the work has been completed properly and in compliance with applicable codes and regulations. The CF2R certification statement and signature indicates that the equipment or feature: 1) was installed properly and it confirms that the information provided on the form properly identifies the installed building component or equipment; 2) is equivalent or more efficient than required by the approved plans (as indicated on the CF1R); and 3) meets all relevant certification or performance requirements.

Refer to §10-103(a)3 for more information about Certificate of Installation requirements.

2.5 HERS Field Verification and Diagnostic Testing

This section describes some of the procedures and requirements for field verification and/or diagnostic testing of energy efficiency features.

Field verification and diagnostic testing is performed by special third-party inspectors called Home Energy Rating System (HERS) raters. The Energy Commission has given this responsibility to the HERS raters, who must be specially trained and certified to perform these services. HERS raters cannot be employees of the builder or contractor whose work they are verifying. Also HERS raters cannot have a financial interest in the builder's or contractor's business, or advocate or recommend the use of any product or service that they are verifying. The training, quality assurance, and general oversight of HERS raters is conducted by Energy Commission-approved HERS providers.

2.5.1 Measures Requiring HERS Field Verification and Diagnostic Testing

The following features require field verification and/or diagnostic testing:

a) Duct Sealing

b) Supply Duct Location, Surface Area and R-Value

c) Low Leakage Ducts in Conditioned Space

d) Low Leakage Air Handlers

e) Verification of Return Duct Design

f) Verification of Air Filter Device Design

g) Verification of Bypass Duct Prohibition

h) Refrigerant Charge in ducted Split System and ducted Packaged Unit Air Conditioners and Heat Pumps, and mini-split systems

i) Refrigerant Charge Indicator Display (CID)

j) Verified System Airflow

k) Air Handler Fan Efficacy

l) Verified Energy Efficiency Ratio (EER)

m) Verified Seasonal Energy Efficiency Ratio (SEER)

n) Maximum Rated Total Cooling Capacity

o) Evaporatively Cooled Condensers

p) Ice Storage Air Conditioners

q) Continuous Whole-Building Mechanical Ventilation Airflow

r) Intermittent Whole-Building Mechanical Ventilation Airflow

s) Building Envelope Air Leakage

t) High Quality Insulation Installation (QII)

u) Quality Insulation Installation for Spray Polyurethane Foam

v) PV Field Verification Protocol

w) Verified Pipe Insulation Credit

x) Verified Parallel Piping

y) Verified Compact Hot Water Distribution System

z) Verified Point of Use

aa) Demand Recirculation: Manual Control

bb) Demand Recirculation: Sensor Control

cc) Multiple Recirculation Loop Design for DHW Systems Serving Multiple Dwelling Units

Field verification and diagnostic testing is only required when certain regulated efficiency measures or equipment features are installed. If such efficiency measures or equipment features are not installed, then field verification and diagnostic testing is not required. For example, if a dwelling that must comply with the Standards does not have air distribution ducts, then HERS verification of duct leakage is not required for compliance.

2.5.2 Verification, Testing and Sampling

At the builder's option, HERS field verification and diagnostic testing may be completed either for each dwelling unit or for a sample of dwelling units. Sampling is permitted only when multiple dwelling units of the same type are constructed within the same subdivision by the same subcontractor. Sampling may also be utilized for alterations for groups composed of dwellings having the same measure installed that requires HERS verification, and where the same installing contractor has installed the measures. More detail on the sampling procedures is provided in Reference Residential Appendix Section RA2.6 and RA2.8.

The builder or subcontractor must provide to the HERS rater a copy of the Certificate of Compliance approved/signed by the principal designer/owner and a copy of the Certificate(s) of Installation (CF2R) signed/certified by the builder or subcontractors as specified in Reference Residential Appendix Section RA2.5.

When compliance requires document registration, prior to performing field verification and diagnostic testing, the HERS rater must verify that transmittal to the HERS provider data registry of the Certificate of Compliance information and the Certificate(s) of Installation (CF2R) information has been completed for each dwelling unit for which compliance requires HERS verification.

For all HERS verification procedures, the HERS rater must confirm that the Certificate(s) of Installation (CF2R) have been completed as required, and that the installer's diagnostic test results and all other Certificate(s) of Installation (CF2R) information shows compliance consistent with the requirements given in the plans and specifications and Certificate of Compliance approved by the local enforcement agency for the dwelling.

If field verification and diagnostic testing determines that the requirements for compliance are met, the HERS rater shall transmit the test results and rater certification/signature to the HERS provider data registry, whereupon the provider shall make available a registered

copy of the completed and signed Certificate of Verification (CF3R) to the HERS rater, the builder, the enforcement agency, and other approved users of the HERS provider data registry. Printed copies, electronic or scanned copies, and photocopies of the completed, signed and registered Certificate of Verification (CF3R) shall be allowed for document submittals, subject to verification that the information contained on the copy conforms to the registered document information currently on file in the HERS provider data registry for the dwelling. A completed, signed and registered copy of the Certificate of Verification (CF3R) must be posted at the building site or made available for review by the enforcement agency in conjunction with requests for final inspection for each dwelling unit.

The HERS provider shall make available via phone or internet communications interface a way for building officials, builders, HERS raters, and other authorized users of the provider data registry to verify that the information displayed on copies of the submitted Certificate(s) conforms to the registered document information currently on file in the provider data registry for the dwelling unit.

NOTE: If the builder chooses the sampling option, the procedures described in Reference Residential Appendix Sections RA2.6and RA2.8 must be followed.

2.5.3 Initial Model Field Verification and Diagnostic Testing

The HERS rater must diagnostically test and field verify the first dwelling unit of each model within a subdivision or multifamily housing development. To be considered the same model, dwelling units must have the same basic floor plan layout, energy design, and compliance features as shown on the Certificate of Compliance for each dwelling unit. Variations in the basic floor plan layout, energy design, compliance features, zone floor area, or zone volume, that do not change the HERS features to be tested, the heating or cooling capacity of the HVAC unit(s), or the number of HVAC units specified for the dwelling units, shall not cause dwelling units to be considered a different model. For multi-family buildings, variations in exterior surface areas caused by location of dwelling units within the building shall not cause dwelling units to be considered a different model.

The initial model testing allows the builder to identify and correct any potential construction flaws or practices in the build out of each model. If field verification and diagnostic testing determines that the requirements for compliance are met, the HERS rater will transmit the test results to the HERS provider data registry, whereupon the provider will make available a registered copy of the Certificate of Verification (CF3R) to the HERS rater, the builder, the enforcement agency, and other authorized users of the HERS provider data registry.

2.5.4 Group Sample Field Verification and Diagnostic Testing

After the initial model field verification and diagnostic testing is completed, the builder, or the builder's authorized representative determines which sampling procedure is to be used for the group of dwellings that require HERS field verification. There are two procedures for HERS verification compliance using group sampling: (1) sampling of a "closed" group

of up to seven dwellings; and (2) sampling of an "open" group of up to five dwellings. The group sampling requirements for each procedure will be discussed in this section.

Transmittal/submittal of the Certificate(s) of Installation information, for at least one dwelling, to the HERS provider data registry, is required in order to "open" a new group. Additional dwellings may be entered into the registry, and included in an "open" group over a period of time, subject to transmittal/submittal of the Certificate(s) of Installation information to the registry for each additional dwelling. However the group shall not remain "open" to receive additional dwellings for a period longer than six months from the earliest date shown on any Certificate of Installation for a dwelling included in a group. A group may be "closed" at any time after the group has been "opened" at the option of the builder or builder's authorized representative, thus the size of a "closed" group may range from a minimum of one dwelling to a maximum of seven dwellings. When a group becomes classified as "closed", no additional dwellings shall be added to the group.

Sampling of a "closed" group of up to seven dwellings requires the following conditions to be met as prerequisite to receiving HERS compliance verification for the group:

1. All of the dwelling units contained in the sample group have been identified. Up to seven dwellings are allowed to be included in a "closed" sample group for the HERS compliance verification.
2. Installation of all the measures that require HERS verification has been completed in all the dwellings that are entered in the group, and registration of the Certificate(s) of Installation for all the dwellings entered in the group has been completed.
3. The group has been classified as a "closed" group in the HERS provider data registry.
4. At the request of the builder or the builder's authorized representative, a HERS rater will randomly select one dwelling unit from the "closed" sample group for field verification and diagnostic testing. If the dwelling unit meets the compliance requirements, this "tested" dwelling and also each of the other "non-tested" dwellings in the group will receive a registered Certificate of Verification (CF3R).

Sampling of an "open" group of up to five dwellings requires the following conditions to be met as prerequisite to receiving HERS compliance verification for the group:

1. At least one dwelling unit from the sample group has been identified. Up to five dwellings are allowed to be included in an "open" sample group for the HERS compliance verification.
2. Installation of all the measures that require HERS verification shall be completed in all the dwellings that are entered in the group, and registration of the Certificate(s) of Installation for all the dwellings entered in the group has been completed.
3. At the request of the builder, or the builder's authorized representative, a HERS rater will randomly select one dwelling unit from those currently entered into the "open" sample group for field verification and diagnostic testing. If the dwelling unit meets the compliance requirements, the "tested" dwelling and also each of the other "non-tested" dwellings

currently entered into the group shall receive a registered Certificate of Verification (CF3R). If less than five dwelling units have been entered into the group, the group shall be allowed to remain "open" and eligible to receive additional dwelling units. Dwelling units entered into the "open" group subsequent to the successful HERS compliance verification of the "tested" dwelling shall also receive a registered Certificate of Verification (CF3R) as a "non-tested" dwelling subject to receipt of the registered Certificate(s) of Installation by the HERS provider data registry for the dwelling. The group shall be "closed" when it reaches the limit of 5 dwellings, when the 6 month limit for "open" groups has been exceeded, or when the builder requests that the group be closed.

The HERS rater must confirm that the Certificate(s) of Installation have been completed as required, and that the installer's diagnostic test results and the Certificate(s) of Installation shows compliance consistent with the Certificate of Compliance for the dwelling unit.

The HERS rater must diagnostically test and field verify the selected dwelling unit, and enter the test and/or field verification results into the HERS provider data registry regardless of whether the results indicate a pass or fail. If the test fails, then the failure must be entered into the provider's data registry even if the installer immediately corrects the problem. In addition, any applicable procedures for re-sampling, full testing, and corrective action must be followed as described in section 2.5.5 of this Chapter below.

If field verification and diagnostic testing determines that the requirements for compliance are met, the HERS rater will enter the test results into the HERS provider data registry. Whereupon the provider will make available to the HERS rater, the builder, the enforcement agency, and to other approved users of the HERS provider data registry, a registered copy of the Certificate of Verification (CF3R) for the "tested" dwelling, and for all other "non-tested" dwelling units entered in the group at the time of the sample test. So as to not create confusion by placing test results on non-tested dwelling units, the HERS provider data registry will not report the testing/verification results of the tested home on the certificate of field verification and diagnostic testing (CF3R) for non-tested dwelling units in a sample group. The testing/verification results will only be reported on the CF3R for the tested dwelling unit of the sample group. However, CF3R forms for non-tested dwelling units will still have a registration number and date, a watermark of the HERS provider's seal, etc. and will specify the dwelling unit was not tested and is part of a sample group.

The HERS provider is required to "close" any "open" group within 6 months after the earliest signature date shown on any Certificate of Installation for a dwelling entered in the group. When such group closure occurs, the HERS provider shall notify the builder that the group has been "closed," and require that a sample dwelling be selected for field verification and diagnostic testing by a HERS rater if field verification has not yet been conducted on a sample dwelling entered in the group.

2.5.5 Re-sampling, Full Testing and Corrective Action

When a failure is encountered during sample testing, the failure must be entered into the HERS provider data registry for retention by the HERS rater. Corrective action must then

be taken on the failed dwelling unit, and the dwelling unit must subsequently be retested to verify that corrective action was successful and the dwelling complies. Corrective action and retesting on the dwelling unit must be repeated until the testing determines that the dwelling complies and the successful compliance results have been entered into the HERS provider data registry. Whereupon, a registered Certificate of Verification (CF3R) for the dwelling shall be made available to the HERS rater, the builder, the enforcement agency, and other authorized users of the HERS provider data registry.

In addition, the HERS rater must conduct re-sampling and test a second randomly selected dwelling within the sample group to assess whether the first failure in the group is unique, or if the rest of the dwelling units in the group are likely to have similar failings. “Re-sampling” refers to the procedure that requires testing of additional dwellings within a group when the initial selected sample dwelling from a group fails to comply with the HERS verification requirements.

When re-sampling in a "closed" group, if the testing of a second randomly selected dwelling in the group confirms that the requirements for compliance credit are met for that unit, then the dwelling unit with the initial failure is not considered to be an indication of failure in the remaining untested dwelling units in the group, and a copy of the Certificate of Verification (CF3R) will be made available for the remaining dwelling units in the group, including the dwelling unit in the re-sample. If the second sample results in a failure, the HERS rater must report the second failure to the HERS provider data registry, and all of the non-tested dwelling units in the group must thereafter be individually field verified and diagnostically tested.

Additional information describing the procedures for re-sampling of closed groups of up to 7 dwellings, and the procedures for re-sampling for open groups of up to 5 dwellings are described in Reference Residential Appendix RA2.6..

2.5.6 Installer Requirements and HERS Procedures for Alterations

When compliance for an alteration requires field verification and diagnostic testing by a certified HERS rater, the building owner may choose for the field verification and diagnostic testing to be completed for the dwelling unit individually; or alternatively, as part of a designated sample group of dwelling units for which the same installing company has completed work that requires testing and field verification for compliance. Generally speaking, the only alterations that will require HERS testing/verification are HVAC changeouts. The building owner or agent of the building owner must complete the applicable portions of a shorthand version of the Certificate of Compliance (the CF1R-ALT) form for their climate zone. When compliance requires HERS verification, the building owner or agent must make arrangements for transmittal/submittal of the Certificate of Compliance information to the HERS provider data registry, identifying the altered HVAC system and measures that require HERS verification. The building owner must also arrange to submit an approved/signed copy of the Certificate of Compliance to the HERS rater.

When the installation is complete, the person responsible for the performance of the installation must complete the Certificate(s) of Installation (CF2R). All required Certificate(s) of Installation must be registered with an approved HERS provider data registry when field verification and diagnostic testing is required.

After verifying that the Certificate of Compliance (CF1R-ALT) and all required Certificate(s) of Installation are completed, signed and registered, the HERS rater must perform HERS compliance verification, and if group sampling is utilized for compliance, the sampling procedures described in Reference Residential Appendix RA2.6.3.3 and RA2.8 for sampling of a ”closed” group of up to seven dwellings must be used, requiring that all dwelling units (HVAC systems) within the group have been serviced by the same installing company. The installing company may request a group for sampling that is smaller than seven dwelling units (HVAC systems). Re-sampling, full testing, and corrective action must be completed, if necessary, as specified by Reference Residential Appendix RA2.6.4. NOTE: Whenever the HERS rater for the group is changed, a new group must be established.

The enforcement agency cannot approve the alteration until the enforcement agency has verified completed, signed and registered Certificate of Compliance (CF1R-ALT), Certificate(s) of Installation (CF2R), and Certificate(s) of Verification (CF3R) documentation for the altered HVAC system. The enforcement agency shall also verify that the installing contractor provides copies of all of these forms to the home owner.

Third Party Quality Control Programs, as specified in Reference Residential Appendix RA2.7, may also be used with alterations, and must be limited to “closed” sample group sizes of thirty dwelling units (HVAC systems) or less. When a Third Party Quality Control Program is used, the enforcement agency may approve compliance based on the Certificate(s) of Installation (CF2R), where data checking has indicated that the unit complies, on the condition that if the required HERS verification procedures determine that re-sampling, full testing, or corrective action is necessary, such work shall be completed.

2.5.7 For More Information

More details on field verification and/or diagnostic testing and the HERS provider data registry are provided in the *2013 Reference Residential Appendices and 2013 Reference Joint Appendices*, as described below:

- Reference Joint Appendix JA7 – Data Registry Requirements
- Reference Residential Appendix RA2 – Residential HERS Verification, Testing, and Documentation Procedures
- Reference Residential Appendix RA3 – Residential Field Verification and Diagnostic Test Protocols

Example 2-9

Question

Given a multifamily building that has used the Duct Sealing HERS credit for compliance for all the dwelling units in the building, what is the correct sampling procedure for HERS field verification and diagnostic testing for the air distribution ducts?

Answer

If the builder of a multifamily building chooses to comply using sampling, then the sampling is done using groups composed of dwelling units that have utilized the same HERS measures for compliance. Dwellings that do not have the same HERS measures specified for compliance are not allowed to be placed in the same HERS sample group. If the whole-building compliance approach has been used, all dwellings in the building, by default, have the same HERS features specified. However, if unit-by-unit compliance approach has been used, and all dwellings do not utilize the same HERS features for compliance, then only the dwellings that have utilized the same HERS features may be grouped together.

For this example, since duct testing is the only HERS measure specified for all of the dwelling units, all of the dwelling units in the building can be grouped together for purposes of HERS verification requirements. The procedures for assigning dwellings to groups and the HERS verification of a sample from each group must follow the same procedure as for single family dwellings described in Section 2.5.2 earlier in this chapter, and in Reference Residential Appendix RA2. The first dwelling unit for each model floor plan in the building must be verified by the HERS rater prior to start of formation of sample groups. For multi-family buildings, variations in exterior surface areas caused by location of dwelling units within the building do not cause dwelling units to be considered a different model floor plan. When verifying a dwelling unit, all the duct systems associated with every HVAC unit in the dwelling must be tested in order to determine compliance for that dwelling. After the HERS verification of the first dwelling of each model floor plan is complete, the HERS rater must randomly select a sample dwelling unit from each group of dwellings that have been formed, and these samples must be tested according to applicable procedures in Reference Residential Appendix RA3, and documented according to procedures in Reference Residential Appendix RA2. In a sampled dwelling unit that is to be tested to confirm compliance, the duct system associated with every HVAC unit in that dwelling unit must be tested. However duct systems do not have to be tested in dwelling units that are not selected for sampling (non-tested dwelling), provided the dwelling that was tested complies. If the tested dwelling in the group complies with the HERS verification, the remaining dwellings in the sample group are certified for compliance based on the results of the sample dwelling test result. Testing must be done on every duct system in a dwelling unit, regardless of whether it appears that the HVAC and duct system are in conditioned space or not. This is akin to a single family residence with one HVAC unit serving upstairs with ducts in the attic and another serving downstairs with ducts between floors.

Defining duct location as "inside" or "outside" for leakage purposes is not described by the locations of walls or the number of stories. The boundary between inside and outside for leakage purposes is defined by the air boundary, typically drywall, between inside and outside. Spaces between floors and spaces in walls (including interior walls) are often "outside" from an air leakage perspective because they are not sealed effectively to form an air barrier and communicate to the outside.

Duct insulation is not required for ducts in directly conditioned space because there is an expectation that there will be reduced conduction losses for these ducts. But to get full credit for ducts in conditioned space, duct leakage must be tested and meet the requirements for duct sealing. In a multifamily building in order for compliance credit to be taken for ducts in conditioned space, all of the duct systems in the building must be in conditioned space unless compliance is documented for each dwelling unit separately. To meet the mandatory requirements, all HVAC units must have ducts made of UL 181 approved materials (i.e., cased coils). Coils enclosed by sheetrock do not meet the mandatory requirements.